ABSTRACT

Campylobacter jejuni was not isolated from fertile turkey eggs or from newly-hatched poults. The organism was present in 16 to 76% of fecal swabs of 15-to-19-day old turkeys from two commercial brooder facilities, and was isolated from litter and drinking water. Extensive cleaning of a brooder house and application of new litter seemed to exclude litter, water, feed, and grit as initial sources of contamination. Newly-hatched poults could be raised in a Campylobacter-free environment for 19 to 21 d without evidence of this organism in fecal swabs.

There is increasing evidence that Campylobacter jejuni can cause gastroenteritis in humans through consumption of contaminated water and food. Consumption of raw milk has been associated with several outbreaks of Campylobacter gastroenteritis (3, 8, 14, 15). Undercooked poultry also has been implicated (4, 9). Several investigators have reported the presence of C. jejuni in fecal material, carcass meat or edible viscera of chickens and turkeys (6, 7, 9, 10, 13). Little or no information is available concerning the source and mode of infection of poultry. This paper reports on the presence of C. jejuni in turkey eggs, poults and brooder house facilities (water, feed, litter and grit) in an attempt to identify possible sources of this organism.

MATERIALS AND METHODS

Enrichment-plating procedure

Isolation and enumeration (MPN procedure) of C. jejuni from turkey eggs, turkey poults, litter, water, feed and grit were accomplished by first preparing a 1:10 dilution of the sample in brucella-FBP-AM broth (5) in sterile glass jars. Appropriate decimal dilutions of the contents of each jar were inoculated into tubes of sterile glass jars. Appropriate decimal dilutions of the contents of each jar were made with brucella broth diluent and 1-ml volumes of these dilutions were inoculated into tubes of brucella-FBP-AM broth according to a 3-tube MPN procedure (1, 5). The jars and tubes were held first for 12 h at 4°C and then were incubated at 42°C for 48 h in 5% O₂:10% CO₂:85% N₂ in the ANEE system. Plates were incubated at 42°C for 48 h in 5% O₂:10% CO₂:85% N₂ in the ANEE system.

Composition and preparation of brucella-FBP-AM broth, brucella-campylobacter agar and brucella broth diluent are described in a previous paper (5). Suspect C. jejuni colonies were submitted to a series of tests (1, 2) to confirm their identity.

Examination of eggs, newly-hatched poults, litter, water, feed and grit

A 1:10 dilution in brucella-FBP-AM broth was made with the following samples: (a) fertile turkey eggs (shell and contents), (b) newly-hatched turkey poults after severance of the spinal cord and opening the abdominal cavity and G.I. tract, (c) a 50-g litter sample taken from a 400-g composite sample collected from various areas from each brooder house, (d) a 25-ml water sample taken from a 200-ml composite sample collected from various waters of each brooder house, (e) a 50-g portion of each of two types of feed samples (one 600-g sample was from the bulk tank where the feed entered the brooder house for temporary storage, the other, a 200-g sample, consisted of pooled random samples from several feeders in the brooder house), and (f) a 25-g grit sample taken from a 100-g sample which consisted of pooled random samples used in the brooder house. Plates were incubated at 42°C for 48 h in 5% O₂:10% CO₂:85% N₂ in the ANEE system.

Fecal swabs of poults raised in sterile incubators

Fecal swabs obtained from turkey poults in two brooder houses were placed in separate tubes of brucella-FBP-AM broth (3 ml). Sterile 6-in. cotton tipped swabs (Puritan, Guilford, ME) were inserted from the vent through the cloaca into the large intestine. After transportation to the laboratory (3 h at 5-7°C), a loopful of broth from each tube was streaked onto a brucella-campylobacter agar plate. The plates were first held overnight at 4°C and then were incubated at 42°C for 48 h in 5% O₂:10% CO₂:85% N₂ in the ANEE system. A loopful of the contents of each tube was then streaked onto brucella-campylobacter agar plates. The plates were incubated for 48 h at 42°C in an atmosphere of 5% O₂:10% CO₂:85% N₂. Plates were then examined for suspect C. jejuni colonies and appropriate diagnostic tests (1, 2) were performed to confirm their identity.

Examination of turkeys raised in sterile incubators

Newly-hatched (1-d old) turkey poults that had been sexed and placed in boxes to be sent to brooder farms were placed in sterile inflatable plastic incubators. Fifteen poults were placed in one large incubator (400 L capacity) and 5 poults in each of the two smaller incubators (200 L capacity). Filtered (0.45-μm filter) air entered the small and large incubators at a rate of 14 and 24 L/min, respectively. A positive air pressure was maintained throughout the experiment. Litter, feed, water, feeders, waterers and storage containers for feed and water were sterilized and placed in the sterilized incubators. Manipulations in the incubators such as replacement of feed and water were done through gloves attached to the incubators. The incubators were kept at 30-35°C. Fecal swabs of poults raised in...
TABLE 1. Examination of fecal swabs of turkeys at two brooder houses for C. jejuni.

<table>
<thead>
<tr>
<th>Sample description</th>
<th>Number tested</th>
<th>% Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brooder house No. 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual samples</td>
<td>25</td>
<td>76</td>
</tr>
<tr>
<td>Pooled samples a</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Brooder house No. 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual samples</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>Pooled samples b</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

aTurkeys in brooder house No. 1 were 19 days old; those in brooder house No. 2 were 15 days old.
bEach pooled sample consisted of swabs obtained from 5 turkeys.

Examination of eggs, poults, water, litter, feed and grit

No C. jejuni was detected in 20 fertile turkey eggs and in 20 newly-hatched turkey poults obtained on two different occasions from two commercial hatcheries in central Texas. The results of an examination of live turkeys, litter, water, feed and grit for C. jejuni at a turkey brooder facility in central Texas are presented in Tables 1 and 2. Of the fecal swabs from individual 19-d old turkeys in brooder house No. 1, 76% of individual samples and 60% of pooled samples (each sample represented a swab from 5 individual turkeys) were positive for C. jejuni (Table 1). Examination of individual 15-d old turkeys in brooder house No. 2 showed that 16% of the fecal swabs were positive for C. jejuni; none of the pooled samples from 15-d old turkeys was positive. C. jejuni was recovered from the water and litter but not from the feed or grit samples in brooder house No. 1 (Table 2). In brooder house No. 2, C. jejuni was isolated from the water but not from the litter, feed or grit samples.

Examination of poults raised in sterile incubators

In each of two trials, 25 newly-hatched turkey poults were raised in a Campylobacter-free environment. In one trial, fecal swabs were obtained from 25 poults at 3, 10 and 19 d of age and in the other trial from 25 poults at 3, 10 and 21 d of age. None of the fecal swabs showed the presence of C. jejuni.

Examination of a brooder house for C. jejuni before, during and after the presence of poults

After a group of turkeys has been moved out of a brooder house and before a new group is placed into the same facility, some cleaning of the premises takes place. This may involve applying a fresh layer of litter (top-dressing) and washing and disinfecting of the feed and drinking water facilities. However, after a disease outbreak among the turkeys, extensive cleaning of the facility, including the use of new litter, takes place before a new group of turkey poults is placed in a brooder house.

The brooder house sampled in this series of experiments (brooder house No. 2) had been cleaned extensively because of a Coryza outbreak in the turkeys, usually caused by Hemophilus gallinarum. No C. jejuni could be isolated from water, litter or feed samples in this brooder house on the day before turkeys were placed in this facility. Fecal swabs from individual 22-d old poults in this facility showed that 28% were positive for C. jejuni. After the poults had been moved to growing pens, management discontinued litter top-dressing. Old litter was completely removed and replaced with new litter. Water, litter, feed and grit samples were again examined for C. jejuni after this brooder house (No. 2) had been cleaned and was ready to receive a new group of turkeys. None of these samples was positive for C. jejuni.

DISCUSSION

Within the limits of the experimental procedure and number of samples examined, the data of the present study suggest that fertile turkey eggs and newly-hatched turkey poults do not contain viable C. jejuni. The high percentage of fecal swabs positive for C. jejuni in turkeys of brooder house No. 1 as compared with those of brooder house No. 2 may have been associated with a difference in age of the birds. Turkeys in house No. 1 were 19-d old, those in house No. 2 were 15-d old. According to the criteria of Skirrow and Benjamin (11), all isolates from turkey poults, water and litter in this study were C. jejuni biotype 1. Although the exact source of C. jejuni in the brooder house facility at this time is difficult to establish, the results of the present study appear to exclude the newly-hatched poult. Also, fresh water, feed, litter, and grit, when examined before introduction into the brooder facility, did not contain C. jejuni. The results with turkey poults main-

TABLE 2. Examination of samples obtained in two turkey brooder houses for C. jejuni.

<table>
<thead>
<tr>
<th>Sample description</th>
<th>Presence of C. jejuni</th>
<th>Sample-broth mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MPN per ml/g</td>
<td>House No. 1</td>
</tr>
<tr>
<td>Pooled water sample</td>
<td>11</td>
<td>&lt;3</td>
</tr>
<tr>
<td>Pooled litter sample</td>
<td>1,200</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Bulk storage feed sample</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Pooled used feed sample</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
</tr>
<tr>
<td>Pooled grit sample</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
</tr>
</tbody>
</table>

aTurkeys in brooder house No. 1 were 19-d old; those in brooder house No. 2 were 15-d old.
bAfter incubation of sample-brucella-FBP-AM broth (1:10) mixtures for 48 h at 42°C, a loopful was tested for C. jejuni by streaking on brucella-campylobacter agar.
tained in a *Campylobacter*-free environment indicate that newly-hatched turkey poults can be maintained for 19 to 21 days without the presence of *C. jejuni* in fecal swabs. Limited data obtained from a brooder house that had been cleaned extensively indicate that some of the sources of contamination with *C. jejuni* had been removed, most likely those pertaining to the drinking water and litter. Drinking water troughs were often contaminated with litter and manure. There is some evidence (12,16) that small animals, such as rodents, cats, dogs and birds, can harbor *Campylobacter* species. It is conceivable that these animals bring these organisms into the brooder house. Sparrows were seen in the brooder houses eating feed and drinking at the waterers. Fecal swabs from two of three sparrows caught in brooder house No. 2 were positive for *C. jejuni*. Cats were kept on the premises as a rodent control. In addition, man, through contaminated footwear, may transfer organisms from one area to another. Additional experiments on the influence of small animal and human involvement in the dissemination of *C. jejuni* in brooder house facilities may contribute additional information on the exact source of *C. jejuni* infection in the turkey.

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**REFERENCES**


**Acuff, et al., con't. from p. 1278**


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